Math 1311
Homework 7 (Section 4.1 - Section 4.2)

Record your answers to all the problems in the EMCF titled **" Homework 7"**.

1. Suppose that f is an exponential function with decay factor 0.099 and that $f(0)=100$. Find a
   formula for $f(x)$.
   a) $f(x)=0.099\times100^x$
   b) $f(x)=100\times0.099^x$
   c) $f(x)=100\times1.099^x$
   d) $f(x)=101\times0.099^x$

2. A certain phenomenon has initial value 8 and decays by 11% each year. Give an exponential
   function that describes this phenomenon using variable t for time in years.
   a) 8×11^t
   b) 0.11×8^t
   c) 0.89×8^t
   d) 8×0.89^t

3. The exponential function $N=1500\times1.19^d$, where d is measured in decades, gives the number
   of individuals in a certain population. Find the yearly growth factor (round to the nearest
   thousandth).
   a)   0.190
   b)   5.695
   c)   1.018
   d)   4.695

4. The exponential function $N=1000\times1.32^d$, where d is measured in decades, gives the number
   of individuals in a certain population. Find the percentage growth rate (rounded to two
   decimal places) per century.
   a)   32.00%
   b)   1605.98%
   c)   1505.98%
   d)   16.06%

5. You initially invest $250 in a savings account that pays a yearly interest rate of 5%, compounded annually. Determine how long it will take for the account to reach $407.22. (take ln or solve.)
   a)   5 years
   b)   8 years
   c)   9 years
   d)   10 years

6. Suppose a certain radioactive substance has a half-life of 2 years. Find how long it will take for 400 grams of the substance to decay to 25 grams.
   a)   6 years
   b)   8 years
   c)   10 years
   d)   12 years

7.   The yearly *inflation rate* tells the percentage by which prices increase. In 1990 an individual retired on a fixed income of $46,000 per year. Assuming that the inflation rate remains constant at 9%, determine how long it will take in years (rounded to the nearest hundredth) for the retirement income to deflate to half its 1990 value. (*Note:* To say that retirement income has deflated to half its 1990 value means that prices have doubled.)
   a)   28.79 years
   b)   7.35 years
   c)   22.22 years
   d)   8.04 years

8.   Suppose a country had a population of 91.68 million in 1975 For the years 1975 to 1985 the population grew at a rate of 4.9% per year. Express in functional notation the population of this country in 1982 and calculate that value (rounded to the nearest hundredth). Assume the formula gives the population N in millions of this country with respect to time t in years from 1975
   a) $N(7) = 123.13$
   b) $N(7) = 128.15$
   c) $N(1982) = 64.50$
   d) $N(7) = 64.50$

9. The exponential function $N = 2000 \times 1.5^d$ where d is measured in decades, gives the number of individuals in a certain population. Find the yearly growth factor (round to the nearest thousandth).
   a) 0.091
   b) 1.41
   c) 1.041
   d) 1.5

10. Find a formula for the exponential function $N = N(t)$ using the information $N(2) = 3375$ and $N(5) = 1$.
   a) $N = 3375 \times (1/15)^t$
   b) $N = 15 \times (1/15)^t$
   c) $N = 759,375 \times (1/15)^t$
   d) $N = 15 \times (1/3375)^t$

11. Determine whether the following table shows exponential data or linear data.

x	0	5	10	15
y	62	135.9	298	653.4

   a) The data are linear.
   b) The data are exponential.

12. For the exponential function $N = N(t)$, increasing t by 1 unit multiplies N by a^6, where $a > 0$. How does an increase by 7 units affect N?
   a) a^{13}
   b) a^{42}
   c) a^7
   d) a^{84}

13. In order to determine its rate of decay, 1 gram of an unknown radioactive isotope was placed in a container. The amount remaining was measured at 1-minute intervals and recorded in the table below.

Time (in minutes)	Grams remaining
0	1.000
1	0.956
2	0.914
3	0.874
4	0.835
5	0.799

Find an exponential model for the data with variable M corresponding to remaining mass (in grams) and t corresponding to time (in minutes).

a) $M = 1 \times 95.600^t$

b) $M = 0.956 \times 1^t$

c) $M = 1 \times 0.956^t$

d) $M = 95.600 \times 1^t$

14. You have invested money in a savings account that pays a fixed monthly interest on the account balance. The following table shows the account balance over the first 5 months.

Time (in months)	Savings balance
0	$1350.00
1	$1367.55
2	$1385.33
3	$1403.34
4	$1421.58
5	$1440.06

Find how long it takes for your money to double in value.

a) 53.66 years

b) 4.47 years

c) 52.97 years

d) 23.67 years

15. The following table shows the income, measured in thousands of dollars, from sales of a
certain magazine at the start of the given year. Find an exponential model for the income
where I is the income, measured in thousands of dollars, and t is the number of years since
2000. Round the parameters to the nearest hundredth.

Year	2000	2001	2002	2003	2004
Income	7.54	8.02	8.52	9.05	9.62

   a) $I = 7.54 \times 1.06^t$

   b) $I = 7.51 \times 0.52^t$

   c) $I = 1.06 \times 7.51^t$

   d) $I = 7.54 \times 0.52^t$

16. Section 4.1 Skill Building Exercise S-2

a) $A = 4 \, X \, 8^t$

b) $A = 8 \, X \, 4^t$

c) $A = 10 \, X \, 7^t$

d) $A = 7 \, X \, 4^t$

17. Section 4.1 Skill Building Exercise S-4

a) $A = 0.7 \, X \, 25^t$

b) $A = .25 \, X \, 7^t$

c) $A = 25 \, X \, 0.7^t$

d) $A = 0.7 \, X \, .25^t$

18. Exercise 4.1 Skill Building Exercise S-6

a) $A = \frac{3}{4^t}$

b) $A = \frac{7}{10^t}$

c) $A = \frac{4}{3^t}$

d) $A = \frac{10}{7^t}$

19. Section 4.2 Skill Building Exercise S-2

a) 261%

b) 60%

c) 361%

d) 61%

20. Section 4.2 Skill Building Exercise S-4

a) 94%

b) 6%

c) 60%

d) 96%